

prominent dark blotches along dorsal fin base and a series of dark blotches along middle of dorsal fin; with indistinct bars on sides; in having 25-27 (rarely 28, usually 26) scales in lateral row, in the presence of 19-20 circumpeduncular scales among other characters.

*Badis* is sometimes called the Dwarf Chameleon Fish due to the considerable colour changes. Predominantly brown with patterned black or red bars, the male will change to a bluish-black pattern with iridescent blue showing in the dorsal, anal, and caudal fins during breeding times and is known only from northern drainages (Menon 1999). The distribution of the species is known to be from Ganges, Yamuna, Brahmaputra (Menon 1999), Godavari drainage (Karmakar and Datta 1998), and from the Mahanadi (Menon 1951). The authentic southernmost limit of *Badis* has been recorded as Mahanadi and Godavari river drainage (Kullander and Britz 2002). A report from Trivandrum, Kerala (Herre 1941), is not vouched in any recent publication. During a fish survey conducted by the first author, *Badis badis* was found in the Chembarampakkam tank in Tamil Nadu. Subadult and adult specimens were collected using a

hand dip net in the clear waters in the overflow area of the tank. The fish is beautifully coloured and has bright red edges on the dorsal fin; has a series of prominent dark blotches along dorsal fin base and has indistinct bars on the body. Though there is a record of this species from Bombay (now Mumbai) and Madras by Day (Kullander and Britz 2002), this species has not been previously recorded from any of the drainages of Tamil Nadu (Menon 1999). Day's Madras is the erstwhile Madras Presidency, which also includes parts of Kerala, Andhra Pradesh, Karnataka and Orissa. This fish could have avoided capture in all the previous surveys due to its hiding behaviour in the aquatic vegetation or more likely could have been brought in by the Krishna Water Supply Scheme, which was directly conveyed to Chembarampakkam lake only during January 2007 (Anon 2007).

#### ACKNOWLEDGEMENT

We thank Mr. Venkat, Dolphin Aquarium, Chennai, for his help in the collection of the specimen.

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## 12. TAXONOMIC STUDIES ON SOME SPECIES OF *OXYA* SERVILLE (ORTHOPTERA: ACRIDIDAE) OF KASHMIR HIMALAYA

M. NAYYAR AZIM<sup>1</sup> AND SHABIR A. RESHI<sup>2</sup>

<sup>1</sup>P.G. Department of Zoology, University of Kashmir, Hazratbal-Srinagar 190 006, Jammu & Kashmir, India.

Email: mnayyarazim@yahoo.com

<sup>2</sup>Section of Entomology, P.G. Department of Zoology, University of Kashmir, Srinagar 190 006, Jammu & Kashmir, India.

### Introduction

The grasshoppers constitute an economically important group of insect. A large number of species can damage crops, and they can attack any type of vegetation in any part of the world including forage crops. In this respect grasshoppers

compete with cattle. This can affect the farmer's ability to use the pastures effectively. Besides, some grasshoppers feed on the most desirable forage plants in the rangeland, leaving the less desirable plants for cattle. The feeding of grasshoppers if coupled with drought conditions can cause long term

deterioration to the forage plant community. Taking into consideration the economic importance of grasshoppers the present work was undertaken to identify the species causing damage to the forage plants in Kashmir, because correct identification is essential for the evaluation of the damage caused by the particular species and developing suitable control measures. The genus *Oxya* Serville is represented by five species in Kashmir. They feed on paddy, maize or on grass. Some workers, such as Hollis (1971) and Usmani and Shafee (1985), have done taxonomic work on this species, but they have not given the detailed account of the species found in Kashmir region. Some contributions have been made by Sharma and Gupta (1997) and by Bhat and Qadri (1999) on the distribution of species in Jammu and in Dachigam National Park, respectively. In the present study, an attempt has been made to provide a detailed account of the species of the genus *Oxya* Serville.

The specimens were collected randomly from different locations of the Kashmir valley. These spots were selected on the basis of different climatic conditions like temperature, humidity and rainfall, different topography like hills, plains, different altitudes and on the basis of different vegetation. The collected material was preserved in 70% alcohol for the study of genitalia and dry mounting for the study of other characters. To study the different parts of the genitalia, the tip of abdomen was detached and boiled in a test tube containing 10% KOH, after boiling the material was thoroughly washed with tap water and normal process of dehydration was followed, clearing was done in clove oil and permanent slides were prepared in Canada Balsam.

The genus *Oxya* Serville can easily be distinguished on the basis of having lower knee lobe of hind femur spined and toothed ovipositor valves. These insects usually feed in large numbers during August and September in Kashmir. The genus is represented by five species in Kashmir, which can be identified on the basis of the following key.

#### KEY TO SPECIES OF *OXYA* SERVILLE FOUND IN KASHMIR

1. Posterior ventral basivalvular sclerites of ovipositor without well-defined spine on its lower margin; ventral surface of female subgenital plate concave with lateral longitudinal ridges ..... 2
- Posterior ventral basivalvular sclerites of ovipositor with one or two tooth like spines on its ventral margin ..... 3
2. Female subgenital plate with median pair of spines on posterior margin set close together; male cercus with bifid apex .....  
..... *Oxya grandis* Willemse
- Female subgenital plate with median pair of spines on posterior margin set wide apart; male cercus conical with subacute apex .....  
..... *Oxya velox* (Fabr.)

3. Ventral surface of female subgenital plate with lateral longitudinal ridges bordering a median concavity; posterior margin not smooth ..... 4
- Ventral surface of female subgenital flat or convex, without lateral longitudinal ridges; posterior margin straight and smooth .....  
..... *Oxya fuscovittata* (Marschall)
4. Ovipositor valves with long hook-like dents; posterior ventral basivalvular sclerite with very small spinelets on its inner ventral margin; lateral longitudinal ridges on ventral surface of female subgenital plate spined; male cercus with subacute or truncate apex .....  
..... *Oxya hyla hyla* Serville
- Ovipositor valves with short dents, posterior ventral basivalvular sclerite with a large spine on its inner ventral margin, lateral longitudinal ridges on ventral surface of female subgenital plate with or without spines; male cercus with bifid subacute or truncate apex ..... 5
5. Lateral longitudinal ridges on ventral surface of female subgenital plate with spines along their whole length; males with antennae much longer than combined length of head and pronotum together; cercus with bifid apex .....  
..... *Oxya japonica vitticollis* (Blanchard)
- Lateral longitudinal ridges on ventral surface of female subgenital plate without spines except at apices; males with antennae as long as or slightly longer than combined length of head and pronotum together; cercus with subacute or truncate apex .....  
..... *Oxya japonica japonica* (Thunberg)

#### *Oxya grandis* Willemse (Fig. 1)

*Oxya grandis* Willemse, 1925. *Tijdschr. ent.* 68: 36.

**Diagnosis:** Antennae as long as or longer than combined length of head and pronotum; tegmina fully developed, anterior margin without spines; male with supra-anal plate having broadly triangular posterior lobe; cercus with bifid apex, epiphallus; with hook-like outer lophi and broad tooth-like inner lophi; ventral surface of female subgenital plate with a long median concavity bordered on each side by a well-developed lateral longitudinal ridge; posterior margin with a pair of small median spines set close together; female ovipositor valves with small dents, posterior ventral basivalvular sclerite without spines on its inner margin.

**Material Examined:** 1 ♀, 3 ♂; INDIA: Kashmir, Baramulla, Safapora on *Oryza sativa*, 9.x.2005 (Shabir A. Reshi); 1 ♀, Srinagar, Harwan on *Oryza sativa* 13.ix.2006 (Shabir A. Reshi).

#### *Oxya velox* (Fabricius) (Fig. 2)

*Gryllus velox* Fabricius, 1787, *Mantissa Insectorum* 1: 239.

*Gryllus chinensis* Thunberg, 1815, *Mem. Acad. Petersb.* 5: 253.

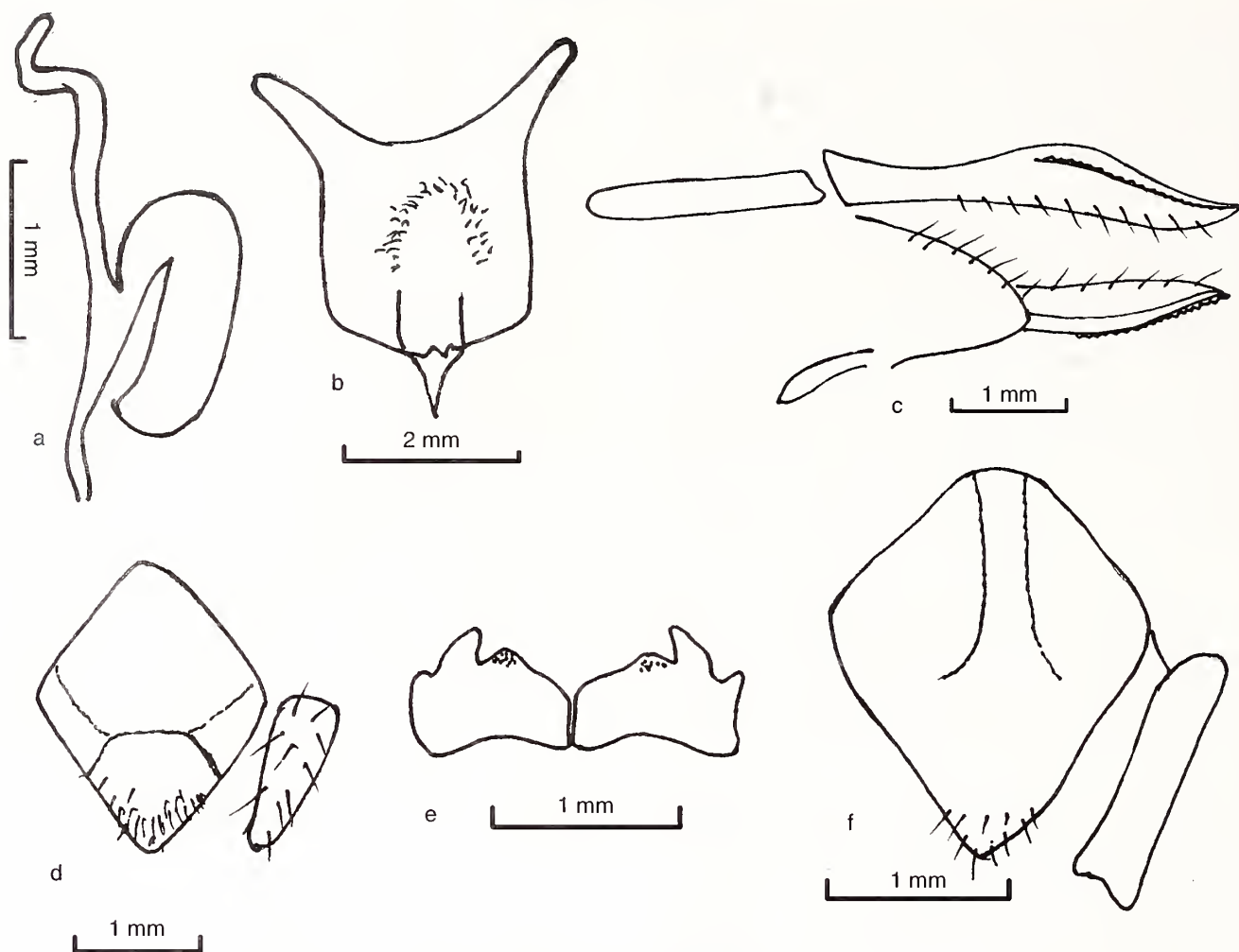


Fig. 1: *Oxya grandis* Willemse

a: Spermatheca, ♀; b: Subgenital plate, ♀; c: Ovipositor valves, ♀; d: Supra-anal plate, ♀; e: Epiphallus, ♂; f: Supra-anal plate ♂

*Gryllus squalidus* Marschall, 1836, *Ann. Wien. Mus. 1*: 213, Syn. by Hollis, 1971.

*Heteracris apta* Walker, 1870, *Cat. Derm. Salt. Coll. Brit. Mus.* 4: 666, Syn by Hollis, 1917.

*Oxya velox* Kirby, 1910, *A Synonymic catalogue of Orthoptera* 3: 393.

**Diagnosis:** Male with supra-anal plate triangular; epiphallus with narrow bridge, ancorae absent, hook-like outer lophi and large tooth-like inner lophi; ventral surface of female subgenital plate with a median longitudinal concavity in the posterior half, bordered on each side by a lateral longitudinal ridge, posterior margin with a pair of median spines set wide apart; spermatheca in females with preapical diverticulum broadly tubular and curved as long as apical diverticulum; ovipositor valves with small and blunt dents, posterior ventral basalvular sclerite without spines on its ventral margin.

**Material Examined:** 1 ♀, Kashmir: Kupwara, Shatgund Payeen on *Oryza sativa*, 10.ix.2004 (Shabir A. Reshi); 4 ♀,

4 ♂, Kupwara, Karnah, Gundi Gujran on *Oryza sativa*, 9.ix.2005 (Shabir A. Reshi); 6 ♀, 11 ♂, Baramulla, Safapora on *Oryza sativa*, 21.ix.2005 (Shabir A. Reshi); 2 ♀, 2 ♂, Srinagar, Dachigam National Park on grass, 23.x.2005 (Shabir A. Reshi).

**Remarks:** This species has been recorded from Kashmir by Kirby (1914). Sharma and Gupta (1997) recorded it from Jammu region.

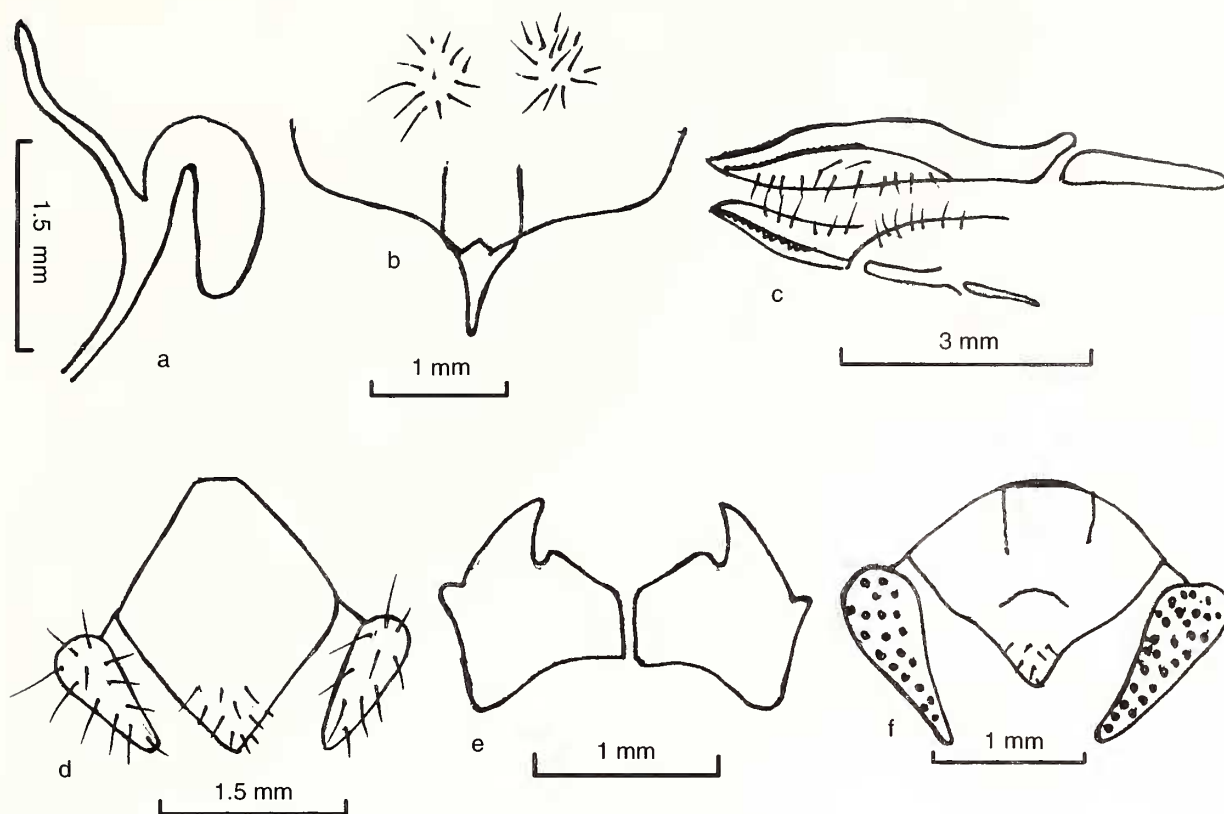
*Oxya fuscovittata* (Marschall) (Fig. 3)

*Gryllus fuscovittatus* Marschall, 1836, *Ann. Wien. Mus. Naturg.* 1: 211.

*Oxya turanica* Uvarov, 1912, *Trudy Russk. Ent. Obshch.* 40: 28 Syn. by Willemse, 1925.

*Oxya oryzivora* Willemse, 1925, *Tijdschr. Ent.* 68: 25. Syn. by Hollis, 1971.

*Oryza uvarovi* Willemse, 1925, *Tijdschr. Ent.* 68: 27. Syn. by Hollis, 1971.

Fig. 2: *Oxya velox* (Fabricius)

a: Spermatheca, ♀; b: Subgenital plate, ♀; c: Ovipositor valves, ♀; d: Supra-anal plate, ♀;  
e: Epiphallus, ♂; f: Supra-anal plate ♂

**Diagnosis:** Male having supra-anal plate with lateral projections more pronounced; cercus strongly compressed and bifid; epiphallus with narrow bridge without ancorae and with boot-shaped outer and tooth-like inner lophi, left lophus less developed than the right one; female with subgenital plate flat on ventral surface, posterior margin almost straight and smooth or sometimes with two very small medial spines; spermatheca with apical diverticulum tubular; ovipositor valves with small uniform blunt denticles, posterior ventral basalvalvular sclerite with small spines on its inner ventral margin.

**Material examined:** 6 ♀, 11 ♂, Kashmir: Kupwara, Shatgund Payeen on *Oryza sativa*, 17.ix.2005 (Shabir A. Reshi); 5 ♀, 2 ♂, Baramulla, Uri, Uranbuha on *Oryza sativa* 21.ix.2006 (Shabir A. Reshi); 4 ♀, 1 ♂, Budgam, on *Zea mays* 10.x.2006 (Shabir A. Reshi).

**Remarks:** This species has been earlier recorded by Hollis (1971) from Kashmir.

#### *Oxya hyla hyla* Serville (Fig. 4)

*Oxya hyla* Serville, 1831. *Ann. Sci. Nat. (Zool.)* 22: 287.

*Heteracris viridivitta* Walker, 1870. *Cat. Derm. Salt. coll. Brit. Mus. (iv)*: 662 Syn. by Kirby, 1910.

*Heteracris humeralis* Walker, 1870. *Cat. Derm. Salt. coll. Brit. Mus. (iv)*: 662 Syn. by Kirby, 1910.

*Oxya serrulata* Krauss, 1891. *Zool. Jb. Syst.* 5: 662 Syn. by Kirby, 1910.

*Oxya acuminata* Willemse, 1925. *Tijdschr. Ent.* 68: 42 Syn. by Hollis, 1971.

*Oxya multidentata* Willemse, 1925. *Tijdschr. Ent.* 68: 44 Syn. by Hollis, 1971.

*Oxya ebneri* Willemse, 1925. *Tijdschr. Ent.* 68: 46 Syn. by Hollis, 1971.

*Oxya hyla hyla* Hollis, 1971. *Bull. Brit. Mus. Nat. Hist. (Zool.)* 26: 282.

**Diagnosis:** Male having epiphallus with narrow bridge, without ancorae, inner lophi usually well-developed; cercus conical or compressed laterally with subacute apex; female having subgenital plate with a pair of median spines set close together on posterior margin; ventral surface with a median longitudinal concavity which is bordered on each side by a longitudinal ridge bearing short spines, spermatheca with preapical diverticulum tubular, slightly longer and broader than apical diverticulum; ovipositor valves with long hook-like denticles, posterior ventral basalvalvular sclerites with very small spinelets on its inner ventral margin.

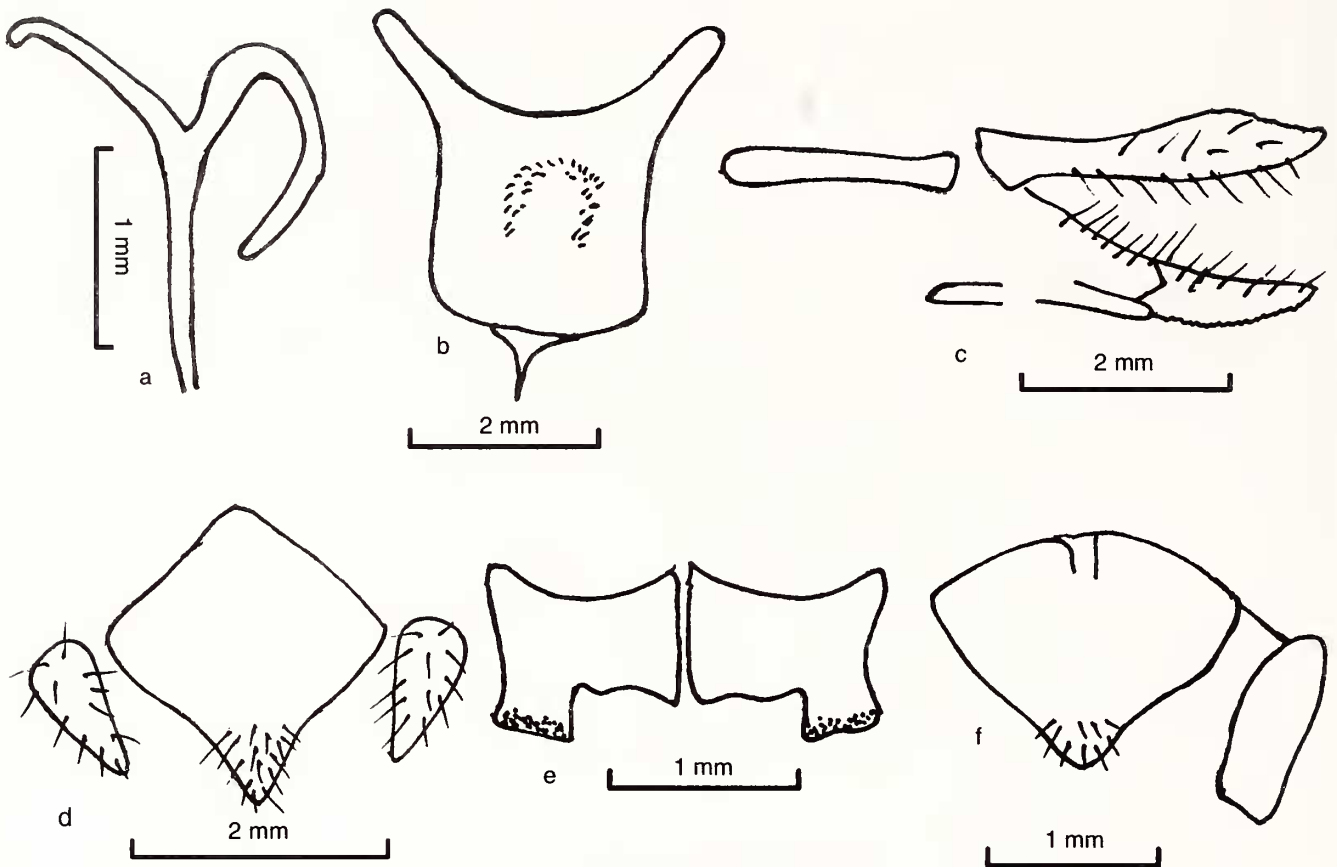


Fig. 3: *Oxya fuscovittata* (Marschall)

a: Spermatheca, ♀; b: Subgenital plate, ♀; c: Ovipositor valves, ♀; d: Supra-anal plate, ♀; e: Epiphallus, ♂; f: Supra-anal plate ♂

**Material Examined:** 4 ♀, 5 ♂, Kashmir: Kupwara, Handwara, Shatgund-Payeen on *Oryza sativa*, 10.ix.2004 (Shabir A. Reshi); 8 ♀, 11 ♂, Kurnah, GundiGujran on *Oryza sativa*, 19.ix.2005 (Shabir A. Reshi); 4 ♀, 2 ♂, Srinagar, Dachigam National Park on grass, 17.x.2005 (Shabir A. Reshi).

**Remarks:** This subspecies has earlier been recorded from Kashmir by Bhat and Qadri (1999).

#### *Oxya japonica* (Thunberg)

*Gryllus japonicus* Thunberg, 1824, *Mem.Acad. Sci. St. Petersberg* 9: 429.

Hollis (1971) recognised two subspecies of *Oxya japonica* (Thunberg), on the basis of characters already given in the key.

#### *Oxya japonica vitticollis* (Blanchard)

*Acridium vitticole* Blanchard, 1853, In: Dumont d'Urville, *J. Voyage an pole Sud*. 4: 373.

*Oxya japonica vitticollis* Hollis, 1971.

*Bull.Brit.Mus.Nat.Hist.(Ent.)* 26: 307.

**Diagnosis:** In females lateral longitudinal ridges on ventral surface of subgenital plate with spines all along their length.

**Material Examined:** 2 ♀, 3 ♂, Kashmir: Kupwara, Handwara on *Oryza sativa*, 13.ix.2006 (Shabir A. Reshi); 2 ♀, 1 ♂, Srinagar, Shalimar on *Oryza sativa*, 17.ix.2006 (Shabir A. Reshi).

**Remarks:** This subspecies has been recorded for the first time from Kashmir.

#### *Oxya japonica japonica* (Thunberg) (Fig. 5)

*Gryllus japonicus* Thunberg, 1824. *Mem. Acad. Sci. St. Petersberg* 9: 429.

*Acridium sinensis* Walker, 1870. *Cat. Der. Salt. Brit. Mus.* (iv): 666 syn. by Hollis 1971

*Heteracris straminea* Walker, 1870. *Cat. Der. Salt.coll. Brit. Mus.* (iv): 669. syn. by Hollis, 1971.

*Heteracris simplex* Walker, 1870. *Cat. Derm Salt. Brit. Mus.* (iv): 669. syn. by Hollis, 1971.

*Oxya lobata* Stal, 1877 *Ofvers. Vetensk. Akad. Forh.*

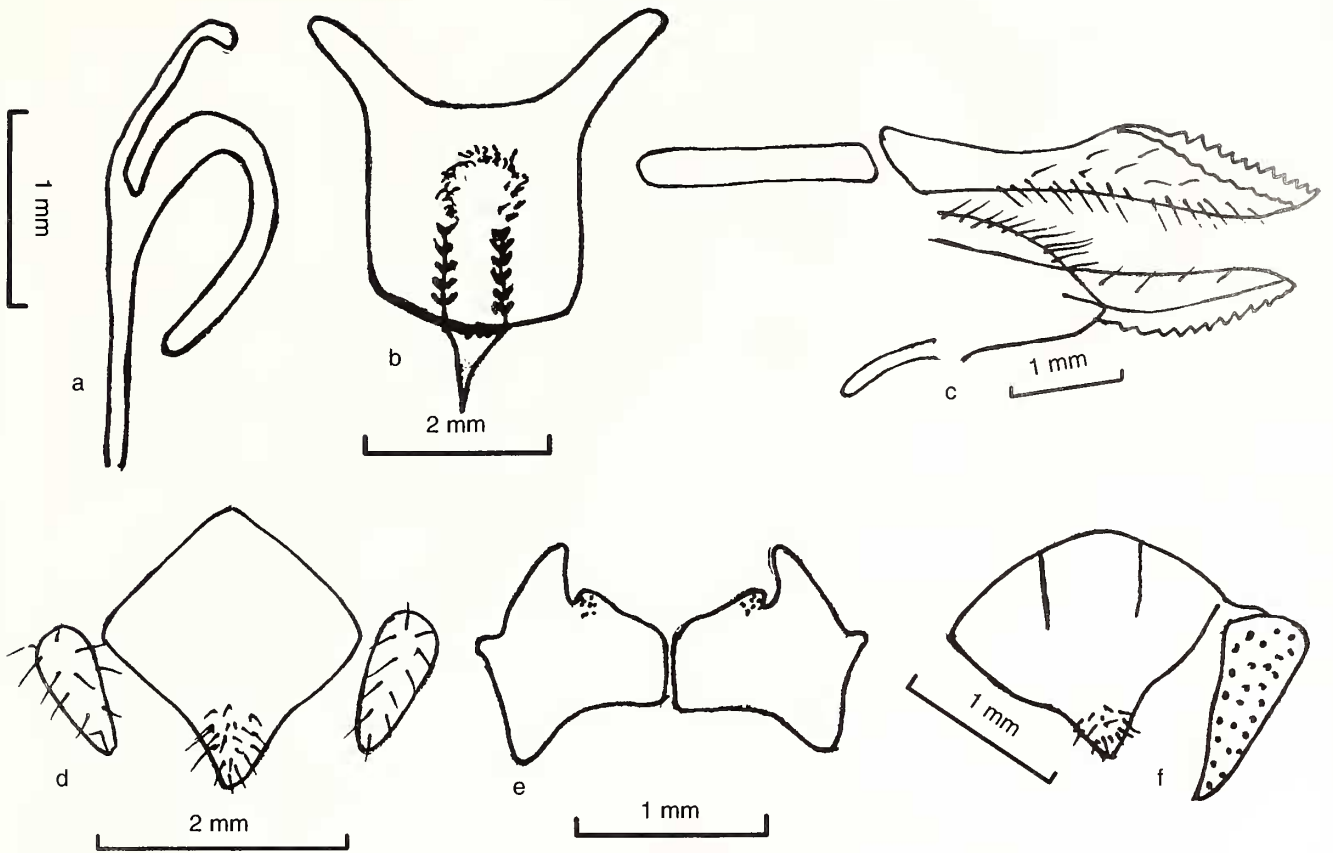


Fig. 4: *Oxya hyla hyla* Serville

a: Spermatheca, ♀; b: Subgenital plate, ♀; c: Ovipositor valves, ♀; d: Supra-anal plate, ♀; e: Epiphallus, ♂; f: Supra-anal plate ♂

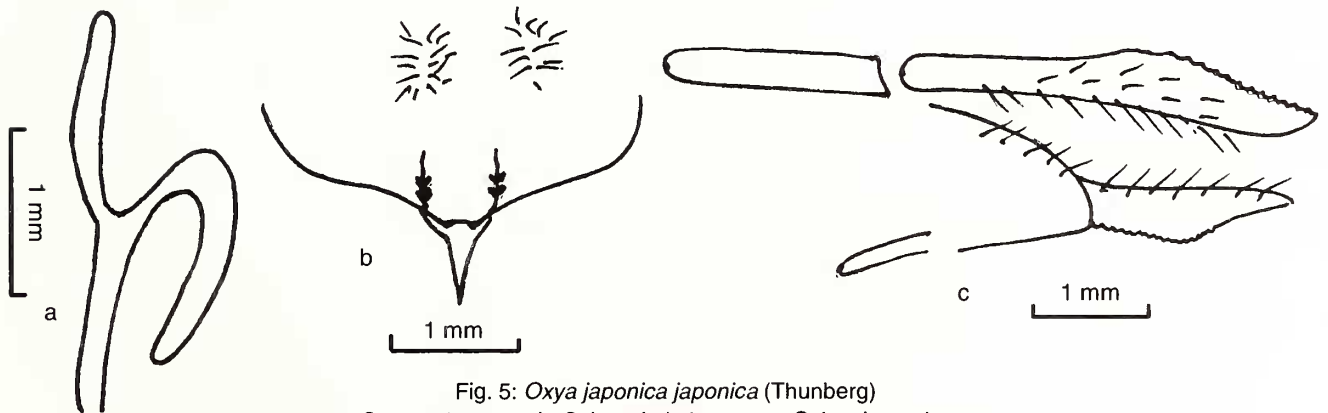


Fig. 5: *Oxya japonica japonica* (Thunberg)

a: Spermatheca, ♀; b: Subgenital plate, ♀; c: Ovipositor valves, ♀

34: 53 syn. by Hollis, 1971.

*Oxya sinensis* Willemse, 1925. *Tijdschr. Ent.* 68: 23. syn. by Hollis, 1971.

*Oxya rufostriata* Willemse, 1925, *Tidschr. Ent.* 68: 33. syn. by Hollis, 1971.

*Oxya japonica japonica* Hollis, 1971. *Bull. Brit. Mus. Nat. Hist. (Ent.)* 26: 302.

**Diagnosis:** Male cercus with bifid apex; epiphallus with narrow bridge, without ancorae with hook-like outer

lophi and short slender inner lophi; female having subgenital plate with a deep median longitudinal concavity along ventral surface bordered on either side by a lateral longitudinal ridge; posterior margin with a pair of median spines set close together; spermatheca with preapical diverticulum tubular, longer than apical diverticulum; ovipositor valves with short dents; posterior ventral basivalvular sclerite with a large spine on its inner ventral margin.

**Material Examined:** 1 ♀, 5 ♂, Kashmir, Kupwara, Handwara on *Oryza sativa*, 13.ix.2006 (Shabir A. Reshi); 5 ♀, 9 ♂, Srinagar, Shalimar on *Oryza sativa*, 17.ix.2006 (Shabir A. Reshi).

**Remarks:** This subspecies has been recorded for the first time from Kashmir

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### 13. A PRELIMINARY NOTE ON THE MARINE AND ESTUARINE MOLLUSCS IN AND AROUND BAHUDA ESTUARY, ORISSA, EAST COAST OF INDIA

S.K. PATI<sup>1</sup>, D. MAHAPATRO<sup>2</sup> AND R.C. PANIGRAHY<sup>3</sup>

<sup>1</sup>Wood Biodegradation Centre (Marine), Institute of Wood Science and Technology, Beach Road, via Yoga Village, A.U Post, Visakhapatnam 530 003, Andhra Pradesh, India. Email: sameer\_pati@yahoo.co.in

<sup>2</sup>Chilika Development Authority, Bhubaneswar, Orissa, India. Email: deasish@gmail.com

<sup>3</sup>Department of Marine Sciences, Berhampur University, Bhanja Bihar, Berhampur 760 007, Orissa, India. Email: rcpanigrahy@yahoo.com

Marine molluscs of India were well-surveyed right from Preston (1910) to Subba Rao (2003). State-wise series of fauna brought out by Zoological Survey of India also include marine molluscs. Relevant publications also contain systematic works on marine molluscs of Orissa. However, contributions to estuarine molluscs from different estuaries of the state are restricted to Mahanadi (Subba Rao 1968; Subba Rao and Mookherjee 1975; Surya Rao and Maitra 1998) and Rushikulya (Rama Rao *et al.* 1992). Therefore, it was felt necessary to gather information on the molluscs occurring in and around Bahuda, another important estuary in Orissa. The results are presented in this communication.

Bahuda estuary (19° 05' N; 84° 44' E) (Fig. 1) is a minor estuary situated extreme south of Orissa, originates from the Eastern Ghats, meanders through several valleys / plains and finally empties into a shallow lagoon that opens into the Bay of Bengal through a channel of about 5 km length and 250 m width. While the banks of the estuary are sandy, those of the lagoon are muddy with no natural hard substratum around. Of course, some concrete jetties were constructed along the channel that joins the Bay.

Random samples were collected every month from the river mouth and the intertidal zone along the shore in estuarine vicinities, during low tide from January to December 2005.

A quadrate frame of 1 sq. m was placed over randomly selected sampling location; sediment up to 10 cm depth was collected and wet sieved with 0.5 mm mesh. Attached forms were removed from the jetties with the help of scalpel, chisel and hammer. All molluscs collected were initially fixed in 5% neutral formalin, later preserved in glycerin ethyl alcohol mixture (1:19) (Gosner 1971). The specimens were subsequently identified up to species level following standard literature (Mookherjee 1985; Subba Rao and Dey 1986; Subba Rao *et al.* 1991, 1992, 1995; Subba Rao and Surya Rao 1993).

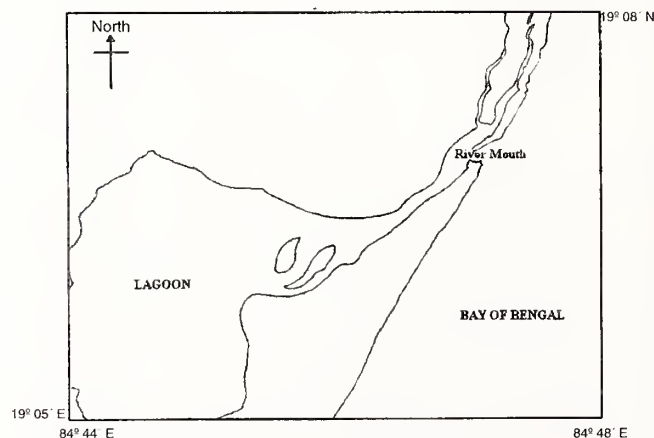


Fig. 1: Map of Bahuda Estuary